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Measuring Terrorism

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Abstract: Terrorism will be high on the political agenda for many years to come. Various policies are open to a government fighting terrorism but, in any case, considerable costs are involved. In the competition for political support, the costs and benefits of anti-terrorism policies will be debated. Better information about terrorism and its consequences can improve policy outcome if there is electoral competition. Over the last few years, economic scholars have analysed the effects terrorist acts have on various aspects of the economy. The findings of these impact studies are summarised in this paper. They capture, however, only part of the overall utility losses. Hence, several approaches to value public goods and conceptual issues concerning their application to terrorism are discussed. In particular, the hedonic market approach, the averting behaviour method, the contingent valuation method and vote and popularity functions are reviewed. Further, an exploratory analysis of estimating individuals' utility losses using life satisfaction or happiness data is presented. This paper also discusses a substantially different approach combining measurement and decision-making, namely popular referenda. (173 words)

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I. Introduction

Terrorism may well be the curse of our times. Recent events suggest that the topic will be high on the political agenda for many years to come. Terrorism is nothing new, however. In many countries in the world, the phenomenon has been prevalent for many decades. Pertinent examples are the acts of terrorism taking place in the Basque Country, Northern Ireland and Palestine. France exemplifies the situation faced by many countries: besides domestic separatist groups, like the *Front de Libération Nationale de la Corse* and the *Armée de Libération de la Bretagne* and domestic (left-wing) terrorist organisations like *Action Directe*, to name just a few, various foreign terrorist organisations committed acts of terrorism (see also figure 2). But, since September 11, issues of terrorism have become even more prominent.¹

There are virtually hundreds of definitions of terrorism, and there is no consensus of opinion as to which is the most relevant one (see e.g. Schmid and Jongman 1988, Badey 1998 and Hoffman 1998). We follow a pragmatic approach to determine what terrorism is. This allows us to interpret and integrate new phenomena, and provoke further thought on the matter. Moreover, any definition should depend on the issue to be analysed and therefore cannot be generalised.

For the purpose of measuring terrorism, the following elements are crucial: The perpetrators

- (i) use force on civilians;
- (ii) act in an unofficial capacity. They are, in particular, not part of the national army and do not wear any national uniform;
- (iii) want to achieve political goals;
- (iv) aim to have far-reaching effects beyond the immediate victims, particularly through the media.

Why is it important to measure terrorism? The fundamental reason for the existence of the state is to overcome the brutish fight of everyone against everyone, because this represents a negative sum game strongly reducing the welfare of everyone. One of the basic elements of any constitutional consensus is therefore to give government the unique right to use force. All

¹ See e.g. Kushner 2002, Wilkinson 2002, and Wilkinson and Jenkins 2003. These books provide extensive references to the literature on terrorism in political science, psychology, sociology, law and history. There are fewer contributions to the study of terrorism by economists. Forerunners are Schelling 1960, 1966, Boulding 1962, Selten 1977 and Landes 1978. Important more recent contributions are Kirk 1983, Atkinson, Sandler, and Tschirhart 1987, Im, Cauley, and Sandler 1987, Cauley and Im 1988, Lapan and Sandler 1988, Lee 1988, Sandler and Lapan 1988, Islam and Shahin 1989, Enders and Sandler 1993, 1995 and 2000, Shahin and Islam 1992, Lapan and Sandler 1993, Rathbone and Rowley 2002, Sandler and Enders 2002, Arce and Sandler 2003 and Schneider 2004. See also Frey 1988, 2003 and Frey and Luechinger 2002 and 2003.

other actors in society must seek to achieve their goals by using peaceful means. Terrorists deliberately undermine this consensus by using force on other people. The government therefore has the task given by the constitution to deal with terrorism. In many cases, governments try to reduce the incidence of terrorism by using counter-force, in particular deterrence policy, imposing negative sanctions on actual and presumptive terrorists. However, deterrence policy has proved to be rather ineffective, and sometimes even counterproductive. But there are alternative means of dealing with terrorism by using a more positive approach (see more fully Frey and Luechinger 2002, 2003, Frey 2003). In any case, government policy against terrorism involves costs. It is therefore necessary to know the costs imposed on the people by terrorist activities.² Only then can the government decide what resources should be mustered to deal with terrorism. If the utility loss is underestimated, the government tends to undertake too little, and if it is overestimated, the government tends to overreact and activate too many resources against terrorism. This holds even if the government is not viewed as a social welfare-maximising agent, but is rather seen to act in a setting characterised by political competition, most importantly the need to stay in power (in a democracy to be re-elected).

The appropriate sample of individuals depends on the goal of the analysis. It should be noted that some persons derive benefits from a decrease of terrorism while others – the terrorists and their supporters, but probably also the police and the armed forces expecting higher allocation of public means – benefit from an increase in terrorism. A classical benefit-cost analysis would take an overall view for a specific territory (country, region or town). In that case, a representative sample of inhabitants (which may include some supporters of terrorism) should be considered. But, in other cases, the government supposed to pursue an anti-terrorist policy is only interested in knowing the benefits from a reduction in terrorism.

The preceding discussion makes it clear that measurement of terrorism does not only include the *number of terrorist acts*. More important are the *consequences for people* reflected in economic losses and, above all, utility losses incurred by the individuals as a result of terrorist activity. This paper discusses seven different methods of evaluating the intensity and subjective evaluation of terrorism. Most of the approaches presented below rely, however, on

² According to economic methodology, the preferences of the individuals are the normative basis to evaluate different policies (Brennan and Buchanan 1985). This holds in the case of expenditures in the fight against terrorism as well. Congleton (2002) and Hobijn (2002) both assess the adequacy of resources devoted to antiterrorism in the aftermath of September 11, without reference to individuals' preferences. Their different assessments reflect the – to some extent – arbitrariness of their reference points. Hobijn (2002) takes as a reference point the military expenditures during the Cold War era and concludes on this basis “that the economic costs of homeland security will be small” (p. 31) and will not evaporate the peace-dividend of the 1990's. Congleton (2002), on the other hand, compares the costs of anti-terrorism policies to the resources devoted to reducing other risks and suggests that the Americans “have grossly overreacted to the current threat” (p. 48).

the evolution of terrorism over time or differences in the intensity of terrorist campaigns between various countries or regions to identify the consequences of terrorism. Both can be captured by the number of terrorist acts or casualties at different locations and/or periods of time. We will, therefore, first address some issues regarding series that contain the number of terrorist acts and number of victims (section II). Section III briefly discusses impact studies. Section IV considers the hedonic market approach and two variants of the averting behaviour approach, which all rely on revealed behaviour. The contingent valuation method, the most prominent stated preference method, is discussed in the following section V. Section VI discusses the possibility of resorting to aggregate evaluation functions based on popularity and election data and on reported subjective well-being measures. A substantially different approach, combining measurement and decision-making, is used in popular referenda (section VII). Conclusions are offered in section VIII.

II. Traditional Measurement

Given a definition of terrorism, the *number of terrorist events* can easily be measured. But this means that terrorist activities of quite different size are indiscriminately lumped together. The attacks against the World Trade Center would be counted as one (or perhaps two) event(s), the same as taking one person as a hostage. It can be asked whether it makes sense to place such widely differing incidents on a common scale. Such measurement can at best capture general developments. But even then, they are useful only if the structure of terrorist events remains more or less unchanged. Thus, measuring the number of incidents makes sense if the share of terrorist hostage-takings and major attacks remains approximately constant.³ In contrast, if in one year (such as in 2001) a major attack occurred, although there have been none of that magnitude in preceding or later years, a time series based on the number of incidents is of little value. Therefore, in order to capture the unequal importance of different terrorist events, most series additionally measure the *number of casualties*. Some data take the number of persons killed, whilst others consider the number of people injured. In the latter case, the problem arises that being seriously injured, with permanent disabilities persisting for the rest of one's life (e.g. if victims lose their eyesight) differs markedly from being only lightly injured. There can be no strict rule as to what to count and what to disregard.

³ Most of the existing data-series on terrorism distinguish therefore between different types of attacks. This, however, is only a partial solution to the problem. A kidnapping with only one hostage is still counted as one incident, the same as a kidnapping with more hostages.

The U.S. Department of State (various years) issues a series covering the number of terrorist events, persons killed and injured. Figure I-1 shows the annual time series for the number of incidents and the number of persons killed in the period 1977-2000 (see also Table A-1 in the Appendix).⁴

Figure 1 about here

The number of events recorded in this statistic exhibits strong fluctuations. It varies between 274 and 665. A high was reached in 1987 and a somewhat lower level again in 1991 and since then it has been declining quite markedly. This finding certainly contradicts the general notion that terrorism has become an increasing threat. As is the case with the number of events, the number of persons killed shows considerable fluctuations. It ranges from 93 in 1992 to 825 in 1985. There are peaks around 1979 and the mid-1990s, but no trend is visible. The same applies to the number of persons injured (see Table A-1 in the Appendix), which varies between 233 in 1979 and 6,291 in 1995. As these series exhibit, the level of transnational terrorist acts has been declining since the early or mid-1990s, while the number of persons killed and injured has not been reduced as much. This implies that terrorism has become increasingly lethal – a common observation made by scholars studying terrorism. According to Enders and Sandler (2002), in recent years an act of terrorism is about 17 percentage points more likely to result in casualties than in the 1970s. This increased lethality has been attributed to the increasing proportion of fundamentalist religion-based terrorist groups seeking mass casualties of innocent people to make their cause widely known. In contrast, the leftist-based and nationalist terrorists want to instigate a revolution and aim at winning the hearts of the people. They therefore avoid killing or maiming innocent people not directly connected with the existing political and economic regime (Juergensmeyer 1997, Hoffman 1997 and 1998).

Overall, the series on transnational terrorism compiled by the U.S. Department of State seems to cover only a rather restricted part of overall terrorist activities throughout the world. The

⁴ Another series is the *RAND-St. Andrews Chronology of International Terrorism* (see e.g. Hoffman and Hoffman 1995). The *Oklahoma City National Memorial Institute for the Prevention of Terrorism* makes this series publicly available on its homepage (www.mipt.org). As Table A-1 and Figure A-1 show, this series exhibits less fluctuation than the U.S. Department of State data. The number of recorded events and persons killed peaked in 1985 with 438 events and 688 fatalities respectively and the maximum number of injured persons was 6,007 in 1995. The lowest levels were recorded in 1994 with 58 events, 5 killed and 53 injured. The cyclical variation is similar to the one of the U.S. Department of State data. Other series are the *Terror Attack Database* constructed by the *International Institute for Counter-Terrorism* and *ITERATE, International Terrorism: Attributes of Terrorist Events*, compiled by Mickolus (1982, 1989, 1993) and recently extended by Fleming (2001) and Sandler and Enders (2002). These series are only partially publicly available. See also Fowler (1981) for an overview of different series.

number of persons killed is rather small compared with, for example, those killed in traffic accidents. (The number of people killed in traffic accidents amount to 40,000 for the United States alone.) This may be due to a well-established problem connected with the measurement of terrorism, which applies in particular to authoritarian and less developed countries, the reporting bias (Miller 1994). Only those terrorist events reflected in official statistics and in the media can be counted. Relying on official statistics is often a mistake, either because the authorities do not know themselves or purposely bias their reporting. The media only pick up some terrorist events, most importantly in the larger cities and capitals, where the foreign journalists tend to reside. Terrorist action taking place in remote rural areas is rarely, if ever, reported in the media.

III. Impact Studies

One of the consequences of terrorism is the losses incurred by individuals in terms of monetary revenues, for instance because the number of tourists declines or investors are less prepared to build up or buy firms in countries affected by terrorism. Over the last few years, economics scholars have analysed the effects terrorist acts have on various aspects of the economy.⁵

Terrorists have often used *tourists* as targets because they are easy to attack. The effect on the choice of tourist location is extensive. The expected cost of a holiday in a country under threat of terrorist attacks is higher than for vacations in an alternative location without the threat of terrorism. The host country is therefore substantially negatively affected by terrorist attacks. At the same time, the resonance in the media is huge. Bombing, shooting and kidnapping tourists often has a highly positive expected net benefit to terrorists and is therefore often undertaken. An example is the Luxor massacre, in which the terrorists of the *Al-Gama'a al-Islamiyya* shot dead 58 foreign tourists visiting the temple of Queen Hatshepsut in the Valley of the Queens in 1997. Another example is the bombing of a disco in Bali in 2002, which cost the lives of almost 200 tourists. Careful econometric analyses using advanced time series methods (vector auto-regression VAR) have been used to study the relationship between terrorism and tourism (Enders and Sandler 1991). The causal direction was found to run from

⁵ Other impact studies than the ones presented below are Abadie and Gardeazabal (2003), Chen and Siems (2002) and Drakos (2002), which investigate the effects of terrorism on stock markets, Nitsch and Schumacher (2002), which analyses the repercussions on international trade, and Glaeser and Shapiro (2002), which examines the impact on urbanisation. Navarro and Spencer (2001) estimate the consequences of the attacks of September 11 on the United States to be in excess of \$100 billion in direct cost, and as much as \$2 trillion in total costs (see also Becker and Murphy 2001, IMF 2001 and Saxton 2002).

terrorism to tourism and not the reverse.⁶ For Spain, in which not only the Basque *ETA* but also other (mostly left-wing) groups have committed terrorist acts, it has been estimated that a typical terrorist act scares away over 140,000 tourists when all the monthly impacts are combined. Similar results have been found for other tourist destinations such as Greece, Austria, Turkey and Israel (Enders, Sandler and Parise 1992, Pizam and Smith 2000 and Drakos and Kutan 2001). Terrorism thus has a substantial effect on tourism. It is transitory but, compared to a situation in which no, or fewer, terrorist acts are committed, the income loss for the host country is large. The relevant comparison is not the number of tourists before the event, because without the event the number of tourists would most likely have risen.

The effect of terrorism on *foreign firms investing money into real foreign assets* must also be expected to be considerable. Terrorists can quite easily attack and damage foreign owned firms, seriously disrupting their activities. They may even be supported, or at least not hindered, by domestic competitors for goods, services and labour. As foreigners have a large choice of countries to invest in, even quite mild terrorist activities may strongly affect the inflow of capital to a terror-stricken country. This has indeed been found to be the case for Spain and Greece, again using the VAR methodology (Enders and Sandler 1996). In Spain, terrorism is estimated to have reduced annual direct foreign investment inflow by 13.5% on average over the period 1968-91. This translates into a decline in real direct foreign investment of almost 500 million dollars, or 7.6% of annual gross fixed capital formation. In the same period, Greece was plagued by two major terrorist organisations, the *17 November* and the *Revolutionary Popular Struggle*. Both are extreme left-wing movements. The reduction of direct foreign investment was estimated to be on average 11.9% annually. This translates into a loss amounting to almost 400 million dollars, or 34.8% of annual gross fixed capital formation. These economic costs are substantial. As direct foreign investment is an important source of saving, investment and economic growth are negatively affected. Moreover, the transfer of technological know-how into these countries was reduced, again dampening growth.

In the light of these substantial impacts, one expects terrorism to have strong adverse effects on economic prosperity. Abadie and Gardeazabal (2003) estimate the overall economic effects of conflict in the Basque Country. The authors construct a “synthetic” control region – using a combination of other Spanish regions – which resembles the Basque Country before the onset of the terrorism campaign. The economic evolution of the “counterfactual” Basque

⁶ Pizam (1978) and Aziz (1995) – among others – hypothesise that tourism causes criminality and particularly terrorism in the host countries.

Country is compared to the economic evolution of the actual Basque Country. After the outbreak of the *ETA*-campaign in 1975, GDP per capita in the Basque Country declined about 12 percentage points relative to the synthetic control region in the late 1970's and about 10 percentage points during the 1980's and 1990's. Moreover, this gap correlates highly with the fluctuating intensity of terrorism.

Impact studies are confronted with a major problem: non-market values are, by definition, excluded from this measure. Thus, option, existence, bequest, prestige and educational values not reflected in market transactions are not counted, though they may be substantial. It follows that the damage done by terrorism may be considerably underestimated. If policy makers take the estimates seriously, they would allocate too little money to dealing with terrorism but rather use the funds and their energy for pursuing other goals.

This problem suggests that impact studies do not measure the overall consequences of terrorism adequately. In the following sections, therefore, different methods are presented to capture total utility losses suffered by the people due to terrorist activities.

IV. Hedonic Markets and Averting Behaviour

The two approaches discussed in this section are based on actual behaviour, or revealed preferences, in contrast to stated preferences, as is the case with contingent valuation. When choosing between different (public and private) goods, individuals make a trade-off that reveals something about the value they place on these goods. In the case of either a complementary or substitutive relationship between the public good and a private good, individuals' Willingness-to-Pay (WTP) for the public good (or the marginal Willingness-to-Accept (WTA) in the case of a public bad) can be inferred from market transactions in the private good. There are two prominent approaches based on these relationships that seem promising for evaluating the WTP for security from terrorism: the hedonic market approach (based on complementarity) and the averting behaviour method (based on perfect substitutability).⁷

⁷ The averting behaviour method has been used to estimate the benefits of a reduction in pollution (Courant and Porter 1981), of ozone control policies (Dickie and Gerking 1991), of reduced soiling (Harford 1984) and of a reduction in the rates of non-melanoma skin cancers (Murdoch and Thayer 1990). The hedonic market approach has been applied to estimate the WTP for a reduction in air pollution (e.g. Harrison and Rubinfeld 1978 and Chay and Greenstone 2000; see also Smith and Huang 1995 for a meta-analysis), distance from toxic waste sites (Kohlhase 1991), visibility of surrounding land (Paterson and Boyle 2002), improvements in cultural amenities (Clark and Kahn 1988) and safety at work (Gegax, Gerking and Schulze 1991).

1. The Hedonic Market Approach

Private markets to some extent reflect the indirect utility losses imposed on individuals by terrorist activity. A pertinent market value is the higher wages to be paid to compensate employees for the disamenities incurred by working in an environment affected by terrorism. Another is the rent for housing and land to be paid, which is negatively affected by terrorism. The wage and rent differentials due to terrorist activities reflect the implicit compensations for the disamenities. In equilibrium, the marginal implicit compensations associated with working or housing in a region plagued by terrorism must be equal to the corresponding marginal WTA. In both cases, the effect of the extent and intensity of terrorism must be isolated from other influences on wages and rents. With sufficient data available, this is possible by running carefully designed multiple regressions. To our knowledge, no study directly examines the influence of terrorism on wages and rents. But results regarding the effects of violent crime suggest that wage and rent differences across regions could be considerably affected by terrorism. Investigating marginal implicit prices for various local amenities in the housing and labour market⁸ across different counties of the United States, Blomquist, Berger and Hoehn (1988) find that individuals living in the county with the most crime are compensated by \$2,267 in the labour and housing markets compared to those living in the county with least crime, and \$1,600 compared to those living in the county with the average rate of violent crime.

The hedonic market approach is faced with four major problems:

- (i) The hedonic market approach is based on the assumption that the market is in equilibrium. This would require individuals to be informed regarding all housing prices and wages, as well as attributes of the jobs and houses and require that transactions and moving costs are low. Price distortions due to market imperfections and illiquid markets may seriously bias the estimates (Pommerehne 1987, pp. 73-74, and Freeman 2003, p. 393). But in many countries affected by terrorism, markets do not work well, partly due to the impact of terrorism. In that case, the hedonic market approach may at best provide some general idea on the gravity of terrorism. But already this may be useful.
- (ii) The adjustment that people are likely to make in response to changes in intensity of a terrorist campaign, as well as changes in the supply side of the hedonic property market, needs to be accounted for (Freeman 2003, pp. 373 and 381).

⁸ The marginal implicit price for a local amenity reflected in either the housing or the labour market is an underestimate of the individuals' valuation of this amenity if purchased simultaneously through both these hedonic markets.

(iii) Similarly, it might be difficult to isolate the effects of terrorism from those caused by government reactions. Government imposed curfews and curtailing of civil liberties entail utility losses that, if not accounted for, bias the estimated utility losses due to terrorism upwards.

(iv) Only reductions in terrorism in one region compared to another, but not an overall reduction in terrorism, can be measured. The two last mentioned problems, however, also apply to other methods of valuing utility losses.

2. Averting Behaviour Method

This method measures the expenditures incurred to avoid, or mitigate, the effects of terrorism and hence are a substitute to government policies. An increase in security leads to a reduction of these expenditures; the marginal change in spending due to improved security reflects the marginal WTP for the change in security. Two costs may be identified.

a. Cost of Exit

Individuals are prepared to undertake expenditures in order to leave a region or country where terrorist acts make life unattractive. These exit costs may be substantial. They involve monetary costs, such as losing one's job and having to sell one's property at a low price and may, moreover, include bribes to secure an exit permit. These costs indicate a minimum only. It may well be that the monetary cost of exit may be low, but that the utility loss suffered by terrorism may nevertheless be high.

This measure relies on two assumptions:

(i) The cost figures only reflect the (minimum) utility loss if the exit is solely caused by terrorist activity. In case other factors are relevant also (for example, that the employment prospects elsewhere are much better) their size must be evaluated and deducted which is difficult to do.

(ii) All barriers to mobility must be reflected in market prices, i.e. in monetary costs. But emigration also imposes psychic costs, most importantly the loss of one's social environment of family and friends, but also the great uncertainty accompanying the act of leaving one's country.

b. Security Expenditures

In environments characterised by terrorism, individuals spend money in order to reduce the impact of terrorist acts on themselves. They invest in tightening the security of their homes, employing private bodyguards, using fortified cars, and sending their children to specially

protected schools. Private enterprises spend considerable amounts of money on protecting themselves against terrorist attacks, particularly by establishing their own police forces and safeguarding their buildings by electronic means (Hobijn 2002). The premiums paid for insurance (if they exist at all) against terrorist attacks provides another indicator of the perceived probability of a terrorist attack occurring, and of the monetary evaluation of the insured objects, including persons.

Three requirements must be satisfied for the averting behaviour method to provide reliable estimates:

- (i) Decisions regarding the optimal amount of a particular averting behaviour are governed by the risk-reduction capability of a particular averting behaviour, as perceived by the individuals and firms. This implies that either the risk-reduction capability is generally known or the researcher knows individuals' and firms' perceptions (Freeman 2003, p. 337). Both premises are highly questionable in the case of defence expenditures against terrorism.
- (ii) The averting behaviour method relies on the assumption of perfect substitutability between a public good (or a government programme that provides that good) and the private good. According to Pommerehne (1987, p. 25), privately provided security services are substitutes for the police in the case of property crimes, but by no means perfect substitutes; this is likely to be even more true in the case of terrorism.
- (iii) Averting behaviour should not affect utility directly, neither positively nor negatively.

The government undertakes similar expenditures. Public money is spent on the police, the army and the secret service in order to fight terrorism and to protect public buildings, politicians and public officials. If terrorism is dealt with by a positive approach (see Frey and Luechinger 2003, Frey 2003), in particular when offering incentives to leave terrorist groups, the respective outlays are also reflecting the utility loss due to terrorism. In the case of public expenditures, the dead weight loss occurred due to additional distortions in the allocation of resources must also be counted. But care should be taken when these expenditures are used as reflections of the (minimum) WTP of the population. This implicitly assumes a perfect political market in which the government adjusts to citizens' preferences. This is, of course, not generally so, in particular in countries torn by terrorism. Normatively, measuring the government expenditures to fight terrorism should not be taken as an indicator of the WTP, because the aim of a benefit-cost analysis exactly is to establish what these expenditures should be.

In addition to the problems connected with the approaches put forward, there are two further obstacles that hamper an evaluation of terrorism based on revealed preferences:

(i) Indirect estimations of utility losses can only be applied if the individuals are aware of changes in the terrorism-risk over time and/or differences across regions (Pommerehne 1987, p. 74, and Freeman 2003, p. 100). Several studies show, however, that people have difficulties in assessing the terrorism-risk. According to Viscusi and Zeckhauser (2003), people are subject to a propensity to predict worst-case scenarios and anomalies known from other risk perception contexts. Hindsight bias and embeddedness effects are particularly evident for terrorism-risk perception. Much higher probabilities are accorded to terrorism than to other life-threatening acts (Hoffman 1998, p. 149). This also implies that unanticipated and cataclysmic terrorist acts cannot be evaluated. Further, revealed behaviour may reflect anticipated future risk rather than current risk. Some of these qualifications also apply to the aggregate evaluation function presented below.

(ii) Only the use values of reduced terrorism are captured, but not negative external effects of various sorts. Following the literature on estimating individual utility gains and losses, one may distinguish between existence value (individuals value peace even if they are not affected by a conflict), option value (individuals wish to have the option of living and working in areas free of, or with a lower level of terrorism), educational value (it is important that everyone learns that not only is a peaceful resolution of conflicts possible, but it also raises welfare, while terrorism is a destructive force for all involved), and prestige value (a region or country is proud of being peaceful and secure). These values are public goods and therefore subject to a tendency to free ride in a market setting. Non-use values can be captured by the contingent valuation method and, to some extent, by aggregate evaluation functions.

V. Contingent Valuation Surveys

Contingent valuation method enables researchers to assess total value that includes non-use value of a reduction in terrorism.⁹ The credibility and validity of results based on the contingent valuation method are the subject of heated controversy in the economic literature. This debate, which became accentuated in the aftermath of the Exxon Valdez oil spill in

⁹ See Carson, Mitchell, Hanemann, Kopp, Presser and Ruud (2003) for an application of contingent valuation in environmental economics. Meta-Analyses, debates and controversies concerning the contingent valuation are the subject of Arrow, Solow, Leamer, Portney, Radner, Schuman (1993), Diamond and Hausmann (1994), Hanemann (1994), Portney (1994), Carson, Wright, Carson, Flores, Alberini (1995), Smith and Osborne (1996), Carson (1997) and Carson, Flores and Meade (2001). The contingent valuation method in cultural economics is the subject of Frey (1997), Frey and Oberholzer-Gee (1998), Santagata and Signorello (2000), Thompson, Berger, Blomquist and Allan (2002), Willis (2002) and Cuccia (2003).

March 1989 and related attempts of damage evaluation, has stimulated a substantial body of research on practical issues and credibility and validity of estimated values.

In a contingent valuation survey respondents are asked to value a specific public good. This is an unfamiliar situation and entails problems of strategic responses. Two key design issues, therefore, have been found to be the presentation of adequate information and the choice of a credible (hypothetical) payment mechanism, in order to confront subjects with a specific and realistic situation and make them believe that they actually could have to pay for the good. Another important design issue is the choice of an adequate elicitation method. In environmental economics, respondents are usually asked to value a policy program that provides a public good rather than to value the public good itself, in order to avoid that they treat the valuation as symbolic. A survey must, therefore, contain a detailed description of a hypothetical policy program, which the respondent believes to be capable of providing the public good in question. In light of the failure of most traditional anti-terrorism policies, this is likely to be a difficult task in designing a reliable survey to value utility losses due to terrorism. Furthermore, respondents must be reminded of the availability of substitutes and their budget constraint. In the literature the referendum format is usually recommended as the appropriate elicitation method, i.e. subjects should be asked if they are willing to pay a specific amount for a specific government program. Only this format is – under certain circumstances – incentive-compatible. Furthermore, the dichotomous decision is relatively simple and similar to many real-life decisions (see Pommerehne 1987, Arrow, Solow, Leamer, Portney, Radner and Schuman 1993, Portney 1994, Hanemann 1994, Carson, Flores, and Meade 2001, Carson, Mitchell, Hanemann, Kopp, Presser and Ruud 2003 and Freeman 2003).¹⁰

Much of the discussion in the literature focuses on the question whether the hypothetical nature of the question inevitably leads to biased and unreliable answers. Critics as well as proponents of the contingent valuation method rely on various approaches to assess the validity and credibility of WTP-estimates of a particular study or contingent valuation studies in general. A first validity assessment approach is the comparison between the answers to the hypothetical survey question and real life market transactions (criterion validity), where this is possible (see List and Gallet 2001 for a meta-analysis). A second validity assessment approach is the comparison with results from revealed preference methods (criterion validity);

¹⁰ To increase validity, one may also consider statistically based probability sampling instead of convenience sampling, in-person interviews instead interviews conducted by mail or over the telephone and follow-up questions or a 'debriefing' section. This ensures that respondents understood the choice and helps to discover the reasons for their answer, information that can be usefully exploited in the data analysis.

this approach was already used in one of the first contingent valuation studies (Davis 1963). The differences can be huge, as exemplified by the evaluation of the utility losses due to the Exxon Valdez oil spill. Using the travel cost method, Hausmann, Leonard and McFadden (1995) estimate the utility losses to be less than \$5 million compared to \$2.8 billion, the estimate of Carson, Mitchell, Hanemann, Kopp, Presser and Ruud (2003) using the contingent valuation method. In their literature review, however, Carson, Flores, Martin and Wright (1996) find rather small discrepancies. Furthermore, discrepancies may be due to a lack of validity of the revealed preference method, the contingent valuation study or both (Freeman 2003). A third possibility is to control whether estimates of WTP react to different factors, as predicted by economic theory (construct validity).¹¹ This includes a test as to whether the income elasticity of the WTP is reasonable (Pommerehne 1987 and Carson, Flores, and Meade 2001). The “embedding effect”, which traces back to Kahneman and Knetsch (1992), is seen as the “major contingent valuation anomaly” (Diamond and Hausmann 1994, p. 46) in the literature. The “embedding effect” refers to an insensitivity of expressed values to changes in the quantity of the good being valued. Literature reviews and meta-analysis, however, reject the hypothesis of inadequate responsiveness to changes in scope and scale (see e.g. Smith and Osborne 1996; Carson 1997). Overall, there is substantial evidence for the validity of contingent valuation survey responses. In light of the serious difficulties connected with the evaluation of terrorism based on revealed preference methods, contingent valuation seems to be a promising approach.

Viscusi and Zeckhauser (2003) survey students to examine the trade-off between money and terrorism-risk. Their main research interest, however, is whether the answers reflect a rational response to terrorism-risks. They asked their subjects what increase in the price of a plane ticket they would be willing to pay if the risk of a terrorist attack on an aeroplane were to be reduced (a) by 50%, (b) to one in a million per flight, (c) to one in 10 million per flight or finally (d) to zero. The average increase subjects are willing to pay for plane tickets is (a) ca. 25%, (b) ca. 38%, (c) ca. 53% and (d) ca. 70% respectively. These estimates reflect a well-known premium for reaching a zero risk level (see Kahneman and Tversky 1979 for the “certainty effect”). Ludwig and Cook (2001) investigate the WTP, not for a reduction in

¹¹ Several critics of contingent valuation reject the method because they think it to be incompatible with economic theory; they make a number of statements about what, according to their view, are permissible arguments in the utility function (see e.g. Diamond and Hausmann 1994). As Hanemann observes, “[critics] argue that people should care about outcomes, not about the process whereby these are generated [...] [and] should value things for purely selfish motives” (Hanemann 1994, pp. 32-33). According to this reasoning, it should make no difference whether a certain number of persons are killed by terrorist attacks or inevitable accidents.

terrorism risk, but for a reduction in crime. They estimate that the Americans' WTP to reduce gun assaults by 30% equals \$24.5 billion, or around \$1.2 million per injury. Both these studies suggest that the contingent valuation method can be applied to evaluate utility losses due to terrorism. Nevertheless, beside design and implementation issues, two further problems have to be kept in mind:

1. What value for whom?

It is not obvious *what* preferences should enter contingent valuation studies of terrorism.

Three aspects are of particular importance:

(i) *Psychological anomalies* play a major role. Most importantly, the disparity between gains and losses matters. This “endowment effect” leads to a major difference between WTP and WTA.¹² It is therefore important whether one asks what people are prepared to pay to reduce terrorism, or what they would be prepared to accept in order to tolerate some extent of terrorism. A review of more than 200 studies indicates that WTA is about seven times higher than WTP. This ratio is even higher in the case of publicly provided goods and the highest for safety and health (Horowitz and McConnell 2002). The question is what evaluation is to count, or equivalently, what initial state is envisaged. Much speaks for taking the status quo and inquiring how high a loss would be evaluated.

(ii) Terrorism is an *international* phenomenon and terrorists often have no difficulty in moving from one country to another. For this reason, anti-terrorism policies by a particular country produce international or even global externalities. On the one hand, an anti-terrorism policy that successfully deters terrorists from attacking a particular country increases the probability of attacks in other countries, because of a substitution of targets on the part of the terrorists (Sandler and Lapan 1988). The same applies in case a government chooses the *paid-rider option* (Lee 1988; Lee and Sandler 1989), i.e. offers terrorists a safe haven in return for the promise not to attack the country. On the other hand, anti-terrorism policies based on positive incentives (Frey and Luechinger 2002; 2003) entail positive externalities for other

¹² Various authors try to explain differences between WTP and WTA in a neoclassical framework. Hanemann (1991), for example, shows that the difference may be governed by a substitution effect and not only a minor income effect. In the case of imposed quantity changes, where the individual is not free to trade to the desired quantity level, “there is no reason why WTP and WTA could not differ vastly: in the limit, WTP could equal the individual’s entire (finite) income, while WTA could be infinite” (pp. 635-636). However, even in the case of inexpensive and ordinary market goods, persistent, albeit smaller, differences between the two measures can be found (Horowitz and McConnell 2002). From a meta-analysis of more than 200 WTA/WTP ratios, Horowitz and McConnell (2003) infer that the available data are not consistent with neoclassical preferences. Thaler (1980) ascribes this finding to the “endowment effect”, which he sees as an extension of the prospect theory from Kahneman and Tversky (1979). See also Gordon and Knetsch 1979, Knetsch 1989, 1995a, 1995b and Knetsch and Sinden 1984. For psychological anomalies in general, see e.g. Kahneman, Slovic and Tversky 1982, Arkes and Hammond 1986, Bell, Raiffa and Tversky 1988, Dawes 1988, Frey and Eichenberger 1989, Thaler 1992.

countries. The dimension of the relevant population, whose values for security from a specific terrorist campaign should be sought, is ultimately an empirical question. Politico-economic and legal considerations suggest, however, that, for politicians, only the opinion of the domestic population will be relevant.

(iii) A similar problem arises with *future generations* who cannot be surveyed at all. Part of the value is taken into account by the bequest motive of the respondents, but the questionnaire has to be very carefully designed.

2. Specific vs. Statistical Values

Individuals evaluate specific objects quite differently from a non-specified, or statistical, object. This disparity has first been found for human lives (Schelling 1984), which play a major role when evaluating the utility loss due to terrorism. People are prepared to spend enormous sums of money to save the life of an identified person, such as of a child who has fallen into a well (see also Small and Loewenstein 2003). They are prepared to spend much less for efforts to save yet unidentified lives by terrorist attacks.

Despite these difficulties, contingent valuation surveys are useful. They provide major insights into the utility losses imposed by terrorism. Compared to the approaches discussed so far, the contingent valuation studies have the major advantage of being able to capture existence, option and bequest values: “ [...] the contingent valuation method would appear to be the only method capable of shedding light on [such] potentially important values” (Portney 1994, p. 14). These non-use values are of great importance in evaluating the utility losses imposed by terrorism.

VI. Aggregate Evaluation Functions

Individuals’ evaluations of terrorism may be captured at the *aggregate level* by focusing on the political reactions of the voters or on the induced changes in reported subjective well-being (or happiness).

1. Vote and Popularity Functions

In many democracies, the vote a citizen casts for a certain party is the strongest instrument he or she can use to show approval or disapproval of past policy or proposed political programmes. This also applies to anti-terrorist policy. Voting reflects the citizens’ evaluation of the outcome of the anti-terrorist policy. Thus, a government’s or party’s popularity, as measured by regular surveys or by its re-election, signals the satisfaction of the people with the government’s policy, also towards terrorism.

This idea lies behind the empirical analysis of so-called vote and popularity functions. The evaluation of economic conditions by the voters, or in regular political surveys, is the subject of an immense literature (it is surveyed, for example, by Paldam 1981; Schneider and Frey 1988; Nannestad and Paldam 1994). While these reactions can be attributed to various models of individual behaviour, the 'responsibility hypothesis' has fared best in empirical analyses. Voters are taken to express a general dissatisfaction when the economy is in a bad state and hold the government responsible. Citizens thus tend to vote in a socio-tropic way, that is based on their perception of the state of the macro-economy rather than on their own economic experience. They also tend to vote retrospectively. Vote and popularity functions have been estimated for a large number of countries and periods primarily to analyse the effect of economic conditions on voters. The estimated coefficients differ greatly in magnitude both over time and across countries, but it is nevertheless possible to indicate broad magnitudes: a one-percentage point increase in the unemployment or inflation rate lowers the voting or popularity percentage of the government by between 0.4 and 0.8 percentage points (Nannestad and Paldam 1994).

To our knowledge, no attempt has been made so far to include the effect of terrorism campaigns or single attacks. But it is to be expected that voters systematically reveal their reaction to how the government deals with terrorism by increasing or decreasing the support of the party in power. Such an approach only makes sense for non-authoritarian countries, in which the citizens may freely vote and where they are not afraid to answer survey questions truthfully. The citizens may consider two different aspects: (1) they may evaluate the effort the government makes to deal with terrorism; (2) they may consider the result of these policies. The procedural and the outcome aspects need not be the same.¹³ It may well be that the government makes a determined effort to come to grips with terrorism, but is not successful; or the government undertakes nothing but, due to some other beneficial factors, terrorism declines. Rational choice theory suggests that the voters should only make the government responsible for the policies undertaken. If voters solely evaluate outcomes, a government may benefit by pure luck, and not necessarily because it acted well. But the research on vote and popularity functions clearly shows that the voters also tend to react to outcomes. In particular, a government lucky enough to be in power during good economic conditions gets a higher level of support, even if the government has done nothing to bring about these favourable conditions (Wolfers 2002). It will be interesting to see to what extent

¹³ See Frey, Benz and Stutzer (2004) for a survey discussing the difference between procedural and outcome utility.

the citizens follow a responsibility hypothesis when evaluating terrorism, and to what extent they also consider outcomes.

Another finding of vote and popularity functions is that voters prefer different parties, depending on the predominant economic problem. Voters assess left wing parties to be more competent in dealing with unemployment and right wing parties to be more competent in dealing with inflation (Rattinger 1980). Similarly, it might be possible to ascertain which party and, consequently, which anti-terrorism policy voters assess to be the most promising.

In one of the first popularity functions, Mueller (1970) investigates the effect of international conflicts on the popularity of American presidents. He finds evidence for a rally-around-the-flag effect, i.e. a surge in popularity in times of international crises, that is largely independent of government reaction to the crises. Similar observations have been made in the case of international terrorist attacks in studies using less sophisticated techniques (see e.g. Nacos 1994). The rally-around-the-flag effect could hamper the evaluation of terrorism or anti-terrorism policies. No inferences can be drawn concerning the importance of terrorism relative to other problems, if terrorist attacks have a positive effect on popularity. Furthermore, if this positive effect is independent of the government reaction to a terrorist attack, different anti-terrorism policies cannot be evaluated using vote and popularity functions.

2. Happiness Functions

People's assessment of their overall well-being is directly captured in the subjective well-being approach (for surveys of this approach in economics, see Frey and Stutzer 2002a,b and 2003). In large representative questionnaire studies, individuals are asked about their level of life satisfaction, happiness or positive and negative affects. In happiness functions, reported subjective well-being is related to individual factors, as well as to economic and political characteristics of the environment. Citizens' well-being is systematically influenced by the political process. This includes terrorism. It stands to reason that people living in a country rife with terrorism are less happy than those living under more orderly political conditions.

The general level of happiness is affected by many different events, among them political ones. Typically, such an event could be the assassination of a dictator, the overthrow of a constitutional government, or also the deep uncertainty created by terrorism, or by not having any firmly established government. A good example is the Dominican Republic in 1962 where, after president Trujillo's murder, the political situation was very unsettled and political chaos was a real threat. The level of life satisfaction recorded in that country was the lowest

ever recorded, namely 1.6 on the normal 0 to 10 scale. By way of contrast, in politically stable democracies, such as Switzerland, Norway or Denmark, the population expresses high life satisfaction. The corresponding values were, for example, in the 1990s 8.16 for Denmark, 8.02 for Switzerland and 7.66 for Norway. Thus, happiness and political stability seem to be closely related.

The causation may, however, run in both directions: while it seems obvious that political unrest is dissatisfying to people, it also stands to reason that dissatisfied people resort to demonstrations, strikes and resort to terrorist actions, therewith creating political instability. But it would be a romantic view (see Tullock 1971) to assume that revolutions are normally caused by people's unhappiness with existing political conditions. Most coups d'état, and even revolutions, are undertaken by competing political clans, parties or the military. There is an exchange of rulers *within* the 'classe politique' itself, only partially fuelled by the people's unhappiness with their rulers. The people's dissatisfaction is often taken merely as an excuse to seize power (see Galetovic and Sanhueza 2000, Weede and Muller 1998, Wintrobe 1998).

The people may also experience unhappiness during periods of national stress caused by unfavourable foreign policy developments and terrorism. In Israel, for example, in the period between June 1967 and August 1979, lower levels of well-being were reported by large segments of the population, in particular women, the less well-educated, the elderly and those not of European or American origin (Landau, Beit-Hallahami and Levy 1998).

Using happiness data to assess the utility losses of the people due to terrorist activity has several important advantages over the approaches discussed so far.¹⁴ Contrary to contingent valuation surveys, this approach does not rely on asking people how they value a public good. The hypothetical nature of these questions is the principal reason for most of the scepticism about, and problems concerning, the contingent valuation method. The evaluation of a public good or a policy programme is likely to be an unfamiliar situation for most of the subjects. It is a demanding cognitive task, and superficial or socially desirable responses, without adequate consideration of the budget constraint or substitutes, can result. To correctly state one's own current level of life satisfaction, in contrast, considerably reduces the "informational and computational burden" on the respondents (Di Tella, MacCulloch and Layard 2002, p. 9). The possibility of strategic response biases is another problem of

¹⁴ Up to date happiness or reported subjective well-being data are rarely used to determine the WTP or WTA for public goods and bads. Van Praag and Baarsma (2000) assess the WTA for noise nuisance effects around the airport of Amsterdam, Welsch (2002) estimates the WTA for urban air pollution in a cross-country analysis and Di Tella, MacCulloch and Layard (2002) investigate the relationship between various macro variables, like environmental indicators, crime rate, divorce rate and macro-economic variables, and life satisfaction.

contingent valuation. There is no reason to expect a strategic response bias when using life satisfaction data.

While approaches based on revealed preferences rely on a number of strict assumptions, like housing or labour market equilibrium in the case of the hedonic market approach, or perfect substitutability in the case of the averting behaviour approach, these stringent conditions do not have to be met in order to evaluate welfare effects through the use of happiness data.¹⁵ The latter approach also captures non-use values. However, it shares, with revealed preference methods, the problem that utility losses may partly reflect the effects of government reactions rather than solely the effects of terrorism.

Several avenues of valuing the utility losses caused by terrorist activity using life satisfaction data can be pursued. One possibility is to follow the lead taken by macro-happiness functions based on international cross-section and time series analyses, for instance trying to identify the effect of environmental conditions (see e.g. Welsch 2002). Alternatively, the subjective well-being of the population in particular regions and cities affected by terrorism may be compared to the remainder of a country. Frey, Luechinger and Stutzer (2003) pursue this latter approach. In the following, the approach is applied to the case of France.

Life satisfaction data are taken from the *Euro-Barometer Survey Series* (1970-1999); the variable is the categorical response to the following question: “On the whole, are you very satisfied [4], fairly satisfied [3], not very satisfied [2], or not at all satisfied [1] with the life you lead?” Moreover, the *Euro-Barometer Survey Series* contains information about the household income and various other socio-demographic and socio-economic characteristics of the respondents. Three indicators of the level and intensity of terrorist activity are constructed on the basis of the *RAND-St. Andrews Chronology of International Terrorism* and the *Terror Attack Database* of the *International Institute for Counter-Terrorism* (see footnote 4): the number of attacks, the number of persons killed and the number of injured persons. The regions to be compared with each other are Ile-de-France (including Paris), Provinces-Alpes-Côte-d’Azur (which includes Corsica in the *Euro-Barometer Surveys Series*) and the rest of France; the data are available for the years 1973 to 1998. Figure 2 depicts average satisfaction with life and the three terrorism indicators.

¹⁵ However, there are the conditions of cardinality and interpersonal comparability of the individual statements of well-being. Although economists are likely to be sceptical about both claims, there is a lot of evidence that both of them may be less of a problem on a practical level than on a theoretical level (see e.g. Kahneman 1999; Frey and Stutzer 2002b).

Figure 2 about here

Based on these data sets, a microeconomic happiness function is specified. Individual life satisfaction y_{itr} , i.e. the life satisfaction y of individual i living in region r at time t , is explained by differences in the level of terrorism q_{tr} across regions and over time, the individual's household income m_{itr} other personal and socio-demographic characteristics \bar{Z}_{itr} , as well as region and time fixed effects. The specification is summarised in the following equation (1):¹⁶

$$(1) \quad y_{itr} = \beta_0 + \beta_1 q_{tr} + \beta_2 \ln(m_{itr}) + \beta_3 \bar{Z}_{itr} + \beta_4 D_t + \beta_5 D_r + \varepsilon_{itr}$$

Table 1 shows the estimation results. The number of terrorist attacks and the number of people killed both have a statistically significant negative effect on reported life satisfaction. For 25 terrorist attacks (i.e. approximately the average number of attacks in France during the period studied), an average reduction in satisfaction with life by 0.07 units on the four point scale is estimated. This effect is of similar size to the difference in life satisfaction between singles and married people (see table A-2 in the Appendix). For a change in the number of fatalities by one standard deviation (i.e. 16 fatalities), satisfaction with life is reduced by 0.06 points. Thus, two frequently used indicators for terrorism are correlated with people's subjective well-being in a sizeable way. However, life satisfaction seems not to be affected by variation in the number of persons injured across regions (panel 3). A possible explanation for the inability to find an effect of the number of injured persons on well-being is that the severity of injuries differs considerably. However, this problem also applies to the number of terrorist attacks. But, in contrast to the number of attacks (and the number of persons killed), the number of injuries is much more a random event. Therefore, the number of injured persons is likely to be an inaccurate indicator for the intensity of the terrorist campaigns in general.

Table 1 about here

The estimated coefficients (β_1 and β_2) in equation (1) can be used to calculate the WTA for a discrete change in the level of terrorism. The increase in annual household income necessary to offset the consequences of terrorism is calculated. Estimates are presented for an individual living in the region Ile-de-France (Paris) with an average of 12.2 attacks or 3.6 persons killed (a) vis-à-vis an individual living in the rest of France (except Provence-Alpes-Côte d'Azur),

¹⁶ In order to control for potential correlation of the error terms across observations that are contained within a cross-sectional unit at any given point in time, robust standard errors are estimated.

with an average of 3.3 attacks or 1.1 persons killed and (b) vis-à-vis an individual living in a hypothetical region without any terrorism. The respective compensations are calculated for an individual with the average household income, i.e. €20,573 per year (1998 euros).¹⁷

The compensation necessary is €3,090 per year (approx. 15%) for an increase of 12.2 attacks per year or €1,192 per year (approx. 6%) for an increase of 8.9 attacks per year respectively. An offsetting increase in annual household income of €2,263 (approx. 11%) would be required if the number of persons killed goes up by 3.6 per year and an increase of €828 (approx. 4%) if it goes up by 2.5 per year. These compensations seem to be high. However, they are comparable to the compensations which Blomquist, Berger and Hoehn (1988) identified on the labour and housing markets for individuals living in the US county with the highest rate of violent crime.¹⁸ This exploratory application demonstrates that life satisfaction or happiness data are well suited to assess the utility loss of the population due to terrorism.

VII. Popular Referenda

Public decisions on dealing with terrorism are taken in the politico-economic process in which politicians, public officials, interest groups and citizens/taxpayers interact within a given constitutional framework. These decisions are normally highly complex due to the many interactions. But the budgetary situation and the administrative constraints are always highly important and determine to a large extent how much money is spent in what ways for dealing with terrorism. In contrast, studies relating to social welfare, and not to political exigencies, are of little importance in the current political process. *Some* actors may under *some* circumstances use the results of such studies to bolster their arguments, provided it suits them. The major problem with the social welfare based studies is that they are *divorced from political decisions*. It is therefore proposed here that the WTP is revealed, and at the same

¹⁷ The WTA for an increase in the level of terrorist activity from q_0 to q_1 is measured by the Compensating Surplus (CS). The CS is the increase in income necessary to hold utility constant. In other words, the CS is the solution to the following expression: $v(m_0; q_0) = v(m_0 + CS; q_1)$, where $v(\cdot)$ is the indirect utility function. In a first step, using the coefficient β_1 of table 1, utility losses Δv for a discrete change in terrorism from q_0 to q_1 are estimated. The utility loss amounts to $\beta_1 \cdot (q_1 - q_0)$, i.e. to $-0.0029 \cdot (q_1 - q_0)$ in the case terrorism is measured by the number of incidents (panel 1 in table 1) and to $-0.0038 \cdot (q_1 - q_0)$ in the case terrorism is measured by the number of persons killed (panel 2 in table 1). In a second step, the marginal utility of income $\partial v / \partial m_0$ at mean household income is calculated. The marginal utility of income is $\beta_2 \cdot (1/m_0)$, that is $0.2345 \cdot (1/20,573.4)$ and $0.2342 \cdot (1/20,573.4)$ respectively. Finally, the estimated utility loss Δv and marginal utility of income $\partial v / \partial m_0$ are used to compute the WTA or CS: $CS = \Delta v / \partial v / \partial m_0$.

¹⁸ According to Blomquist, Berger and Hoehn (1988), the compensation amounts to \$2,267 for those living in the county with the highest crime compared to those individuals living in the county with the least crime, and the to \$1,600 compared to those living in the county having the average rate of violent crime. This corresponds to 11% percent and 8% percent respectively of annual household income. Compensation relative to a hypothetical county with no violent crime is not estimated.

time the decision taken, by *popular referenda*. As a decision mechanism, referenda have many advantages over democratic decisions via representation. In particular, it avoids the principal-agent problem and constitutes an effective barrier against the ‘classe politique’ (see e.g. Frey 1994, Bohnet and Frey 1994). Both aspects are of particular importance with respect to domestic security decisions, because the politicians and bureaucrats tend to have a larger discretionary room in this area than elsewhere.

In countries torn by terrorism, the government may ask the citizens whether they support particular measures against terrorism. They may refer to specific security measures (such as the establishment of a special anti-terrorism police force) and, even more importantly, to a reduction of civil liberties (such as the implementation of a systematic and computerised search for wanted persons by means of descriptive profiles – as the “Rasterfahndung” of the German police against members of the *RAF*, the revocation of habeas corpus, or the imposition of a curfew).

Italy is the only country where anti-terrorism legislation was subject to referenda (Bogdanor 1994; Butler and Ranney 1994; Uleri 1996). In 1969, the *Brigate Rosse* was formed out of the student protest movement. It advocated violence in the service of class warfare and attacked symbols of ‘the establishment’ such as businessmen, politicians and unionists. In 1979, in what became a hallmark of Italian terrorism, the *Brigate Rosse* kidnapped the former Prime Minister Aldo Moro. He was killed after being held captive for nearly two months. As a response to the group’s terrorist campaign, repressive anti-terrorism laws have been enacted, such as the “legge Reale sull’ordine pubblico” of 1975 and the “legge Cossiga” or “legge antiterrorismo” of 1979. The “legge antiterrorismo” justified nearly any kind of violation of individual rights; besides the use of the stick, a carrot in the form of a principal witness program was offered. Both acts were subject to a referendum, because of initiatives to repeal the respective acts. The referendum on the “legge Reale” was held in June 1978, shortly after the homicide of Aldo Moro; 76.5% of the electorate were in favour of the act (with a turnout of 81.4%). The referendum on the “legge Cossiga” was held in May 1981, with 85.1% of the electorate in favour of the act (with a turnout of 79.4%).

The following counter-arguments are often raised against the use of popular referenda:

1. Incapable Citizens

Voters are charged with being both uninformed and unintelligent and therefore cannot be trusted to make ‘good’ decisions. The criticism concerning the lack of information is doubtful, because when citizens are given the power to decide, they will inform themselves;

they do not acquire much information today as they cannot decide anything. The state of information is not given, but endogenous (see the empirical evidence in Benz and Stutzer 2004). The discussion process *induced* by the referendum produces the necessary information to decide, a service which the researcher has to artificially perform when undertaking a CV-survey. With respect to the lack of intelligence, referenda are, of course, in exactly the same position as all WTP methods: in each case, individual preferences - and not the (supposedly) superior insights of a cultural/political elite - count. As one of the major goals of terrorist attacks is to attract media attention, the citizens can be assumed to be quite well informed about terrorist attacks occurring in their location. They are likely to have a good sense for evaluating the usefulness of various measures to deal with terrorism.

2. Superficial Citizens

Voters are charged with not taking referendum decisions seriously. It is quite true that they are 'low cost' (see Kliemt 1986, Kirchgässner and Pommerehne 1993), but this equally applies to contingent valuation procedures (but not to revealed preference methods). One may even argue that individuals respond to a survey even more lightly because the situation is purely hypothetical. Referendum voting is, moreover, connected with significant personal cost when the pre-referendum discussion is intense. In that case, not to have, and not to be able to defend, a particular position (and voting rights) is negatively sanctioned by the citizen's social environment (see Frey 1994). To the extent that terrorism is a serious issue, the citizens are certainly concerned about it and will have an incentive to take a well-reasoned decision at the polls. The fact that one's revelation of preference is connected with a binding democratic decision tends to raise the seriousness with which the decision is taken.

3. Propaganda Influence

In referenda, the interest groups and parties seek to affect the vote via newspaper, radio and television campaigns. A precondition is an open society, which is defined by admitting propaganda from *all* sides, and it is therefore not a priori clear what the effect is. Normally, the police and the military interests are well organised and motivated and are therefore likely to significantly influence the discussion process. But there are also opposing groups, such as peace movements, which make their views known and which may support alternative measures, such as trying to re-integrate terrorists and their supporters back into the legitimate political process.

4. Restricted Participation

Referendum participation is constrained in two ways:

- (i) Citizens decide not to vote. The major reason for non-participation is the lack of interest, and it may therefore be argued that it is not so bad if such people do not vote.
- (ii) Some people, especially foreigners and future generations, are formally excluded from voting. But this restriction also applies to many approaches to assess the WTP for security from terrorism.

These arguments suggest that there are circumstances in which referenda are a suitable means to identify the citizens' evaluation of terrorism and to implement the consequent policies. An important precondition is that the terrorists may not disrupt the vote by using force. The voters must have the possibility to cast their vote freely according to their preferences. Even in a country torn by terrorism, this condition may be met if foreign vote observers are able to guarantee a fair voting procedure.

VIII. Conclusions

The major result of our discussion has been that the hedonic market approach, the averting behaviour method, the contingent valuation method as well as vote and popularity functions and, in particular, happiness functions may be useful approaches to evaluate the utility loss caused by terrorism. Each of the approaches has particular advantages and disadvantages and should be used depending on the goal of the analysis. The methods based on revealed preferences rely on stringent assumption and requirements, the unfamiliar and hypothetical situation in contingent valuation surveys may entail unreliable results and strategic behaviour, and the evaluation of terrorism using vote and popularity functions may be hampered because of the rally-around-the-flag effect. The calculation of the utility loss due to terrorism based on happiness and life satisfaction data shares with revealed behaviour methods the problem that people's perception, rather than some objective measure of the intensity of terrorism, affects their utility. Further, government reactions, that cannot be accounted for, may bias the results. In many cases, it may be useful to apply various methods in order to capture the different dimensions.

When the evaluation of the utility losses induced by terrorism are used in the context of a benefit-cost analysis, it is useful to compare the benefit-cost ratio to government activities in other cases. The decrease in casualties due to particular anti-terrorist expenditures can be compared to the decrease in casualties, for instance, with traffic control. It is important how

much money is spent on reducing the number of deaths due to terrorism, compared to those due to traffic accidents and other reasons (see Viscusi and Aldy 2003 for a critical review of studies that provide estimates of the value of a statistical life using revealed preference methods). But it remains open whether the individuals place the same value on a death due to terrorism as on a death due to a traffic accident. It may well be that the deaths caused by mobility are taken to be (more or less) immutable, while those caused by terrorism are judged to be subject to government measures.

But these approaches have a decisive disadvantage: they are not connected to political decisions. Popular referenda combine the evaluation of competing alternatives with democratic decisions. It has been argued that this combination is relevant for decisions on how to deal with terrorism. Economists wanting to contribute to dealing with terrorism should suggest constitutional changes allowing and prescribing the use of popular referenda for the respective political decisions.

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Table 1. Terrorism and life satisfaction in France, 1973-1998; summary

<i>Dependent Variable</i>	(1)		(2)		(3)	
Life satisfaction	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
<i>Terrorism indicators</i>						
Number of incidents	-0.003**	-4.49				
Number of persons killed			-0.004(*)	-1.97		
Number of persons injured					0.000	0.02
<i>Income</i>						
ln(income)	0.234**	20.00	0.234**	19.93	0.234**	19.97
<i>Individual characteristics</i>	Yes		Yes		Yes	
<i>Year dummies</i>	Yes		Yes		Yes	
<i>Region dummies</i>	Yes		Yes		Yes	
<i>Constant</i>	Yes		Yes		Yes	
Number of observations	46'763		46'763		46'763	
Number of clusters	70		70		70	
Prob > F	0.000		0.000		0.000	
R ² adj.	0.08		0.08		0.08	

Notes: (1) Least squares estimations; (2) Standard errors are adjusted for clustering within regions per year; (3) ** is significant at the 99 percent level, * at the 95 percent level, and (*) at the 90 percent level.

Source: Euro-Barometer Survey Series, 1970-1999, RAND-St. Andrews Chronology of International Terrorism, 1968-2000, provided by the Oklahoma City National Memorial Institute for the Prevention of Terrorism (www.mipt.org), Terror Attack Database of the International Institute for Counter-Terrorism (www.ict.org.il).

Table A-I. Transnational Terrorism, 1977-2000; Number of incidents, persons killed and injured

Year	U.S. Dept of State data			RAND data		
	Incidents	Fatalities	Wounded	Incidents	Fatalities	Wounded
1968	-	-	-	132	32	191
1969	-	-	-	155	12	110
1970	-	-	-	215	105	161
1971	-	-	-	150	66	91
1972	-	-	-	171	191	166
1973	-	-	-	193	72	504
1974	-	-	-	237	229	690
1975	-	-	-	221	102	556
1976	-	-	-	325	346	805
1977	419	230	404	242	80	299
1978	530	435	629	242	263	405
1979	434	697	542	271	290	1,060
1980	499	507	1,062	268	156	332
1981	489	168	804	318	329	1,187
1982	487	128	755	384	188	637
1983	497	637	1,267	317	589	1,045
1984	565	312	967	326	182	502
1985	635	825 ⁺	1,217	438 ⁺	688 ⁺	1,255
1986	612	604	1,717	379	346	1,221
1987	665 ⁺	612	2,272	355	358	1,219
1988	605	407	1,131	377	593	1,869
1989	375	193	397	367	170	507
1990	437	200	675	302	121	366
1991	565	102	233 ⁻	436	175	284
1992	363	93 ⁻	636	310	154	751
1993	431	109	1,393	320	464	2,806
1994	322	314	663	58 ⁻	5 ⁻	53 ⁻
1995	440	163	6,291 ⁺	258	245	6,007 ⁺
1996	296	314	2,652	267	516	3,192
1997	304	211	693	200	230	887
1998	274 ⁻	741	5,952	-	-	-
1999	395	233	706	-	-	-
2000	426	405	791	-	-	-

Note: ⁺ denotes the highest value in a row, ⁻ the lowest value

Source: U.S. Department of State, Patterns of Global Terrorism (various years), Sandler and Enders (2002), Table 1, and RAND-St. Andrews Chronology of International Terrorism, 1968-2000, provided by the Oklahoma City National Memorial Institute for the Prevention of Terrorism (www.mipt.org).

Table A-2. Terrorism and life satisfaction in France, 1973-1998; including control variables; part 1

Dependent Variable	(1)		(2)		(3)	
Life satisfaction	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
<i>Terrorism indicators</i>						
Number of incidents	-0.003**	-4.49				
Number of persons killed			-0.004 ^(*)	-1.97		
Number of persons injured					0.000	0.02
<i>Income (household)</i>						
ln(income)	0.234**	20.00	0.234**	19.93	0.234**	19.97
Income not available	2.289**	19.98	2.286**	19.92	2.286**	19.96
Size of household ^{1/2}	-0.096**	-8.59	-0.095**	-8.51	-0.095**	-8.49
Size of household not available	-0.137	-1.38	-0.136	-1.38	-0.135	-1.36
<i>Individual characteristics</i>						
Male			Reference group			
Female	0.034**	4.02	0.034**	4.04	0.034**	4.03
Age	-0.020**	-11.19	-0.020**	-11.20	-0.020**	-11.21
Age ²	0.000**	12.60	0.000**	12.62	0.000**	12.64
Education, -15 years			Reference group			
Education, 16-19 years	0.078**	7.42	0.078**	7.42	0.078**	7.43
Education, 20 years and more	0.204**	14.60	0.205**	14.59	0.205**	14.57
In education	0.185**	9.44	0.185**	9.46	0.185**	9.47
Education not available	0.065	0.77	0.066	0.78	0.066	0.79
No children			Reference group			
One child	0.001	0.07	0.000	0.00	-0.000	-0.03
Two children	0.022	1.29	0.021	1.21	0.020	1.18
Three children	0.023	0.86	0.022	0.79	0.021	0.77
Four children and more	-0.071	-1.51	-0.073	-1.56	-0.073	-1.57
Number of children not available	-0.146	-1.63	-0.144	-1.60	-0.143	-1.60

Table to be continued.

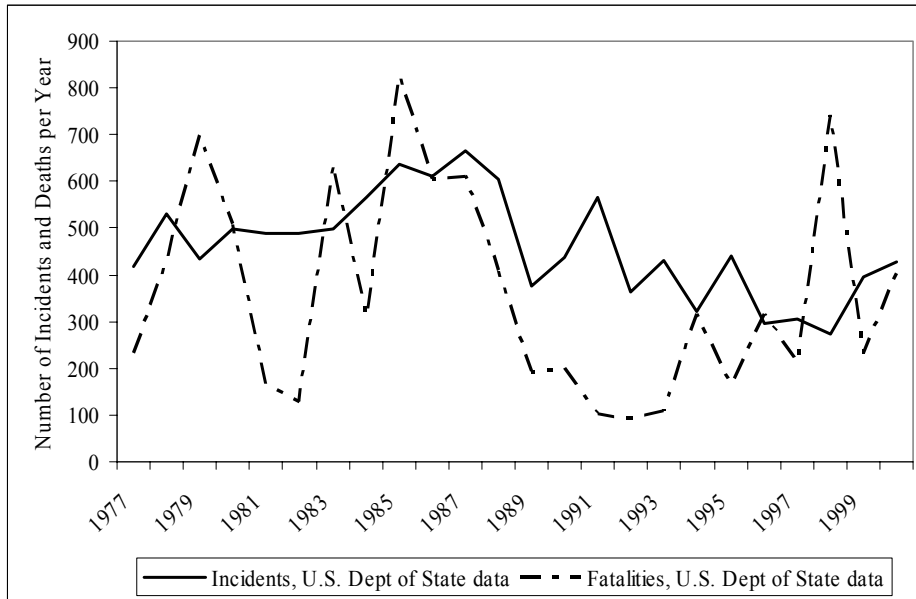
Table A-2. Terrorism and life satisfaction in France, 1973-1998; including control variables; part 2

<i>Dependent Variable</i>	(1)		(2)		(3)	
Life satisfaction	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>	<i>Coefficient</i>	<i>t-value</i>
Single	Reference group					
Married	0.071**	5.60	0.071**	5.59	0.071**	5.57
Living together	0.002	0.11	0.001	0.09	0.001	0.08
Divorced	-0.147**	-6.72	-0.148**	-6.78	-0.148**	-6.77
Separated	-0.182**	-5.43	-0.183**	-5.46	-0.183**	-5.45
Widowed	-0.079**	-4.24	-0.079**	-4.26	-0.079**	-4.25
Marital status not available	-0.119	-1.48	-0.117	-1.45	-0.116	-1.44
Employed	Reference group					
Unemployed	-0.197**	-8.57	-0.198**	-8.57	-0.198**	-8.57
Retired	0.165**	10.26	0.165**	10.26	0.165**	10.28
Housewife	0.068**	5.56	0.068**	5.54	0.068**	5.55
Other occupation	0.166**	6.08	0.166**	6.08	0.165**	6.09
Occupational status not available	0.043	1.18	0.043	1.19	0.043	1.19
Living in a rural area	Reference group					
Living in a small town	-0.066**	-5.78	-0.066**	-5.80	-0.066**	-5.80
Living in a big town	-0.084**	-7.33	-0.085**	-7.42	-0.085**	-7.38
Size of community not available	0.012	0.81	0.012	0.81	0.012	0.83
<i>Year dummies</i>	Yes		Yes		Yes	
<i>Region dummies</i>	Yes		Yes		Yes	
<i>Constant</i>	1.095**	5.45	1.096**	5.48	1.090**	5.45
Number of observations	46'763		46'763		46'763	
Number of clusters	70		70		70	
Prob > F	0.000		0.000		0.000	
R ² adj.	0.08		0.08		0.08	

Notes: (1) Least squares estimations; (2) Standard errors are adjusted for clustering within regions per year; (3) ** is significant at the 99 percent level, * at the 95 percent level, and (*) at the 90 percent level.

Source: Euro-Barometer Survey Series, 1970-1999, RAND-St. Andrews Chronology of International Terrorism, 1968-2000, provided by the Oklahoma City National Memorial Institute for the Prevention of Terrorism (www.mipt.org), Terror Attack Database of the International Institute for Counter-Terrorism (www.ict.org.il).

Figure 1. Transnational Terrorism, 1977-2000; Number of events and persons killed



Source: U.S. Department of State, Patterns of Global Terrorism (various years) and Sandler and Enders (2002), Table 1.

Figure 2a: Mean level of life satisfaction in France, 1975-1998

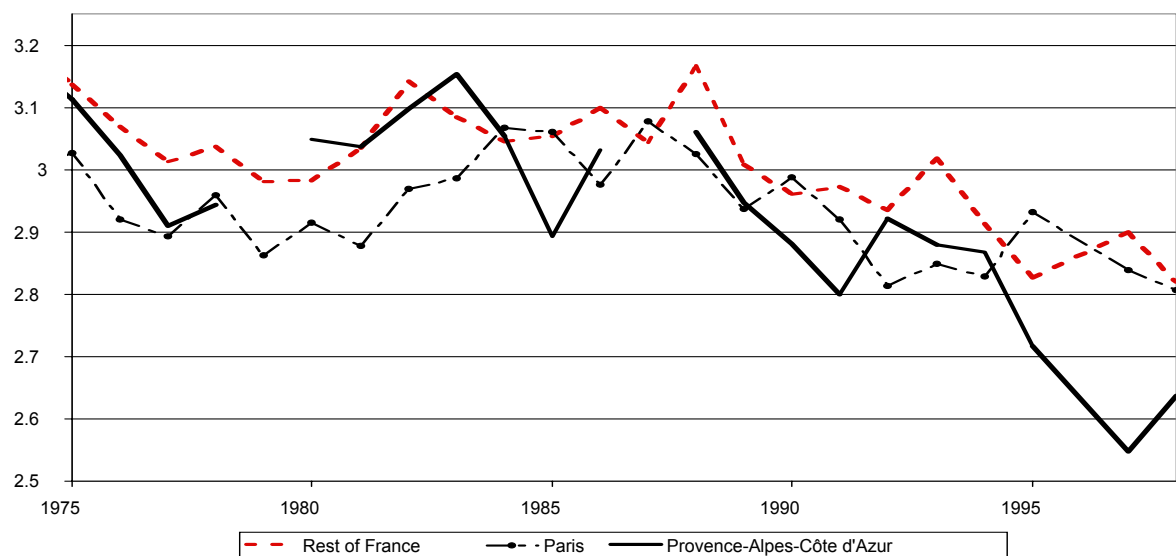


Figure 2b: Number of incidents in France, 1975-1998

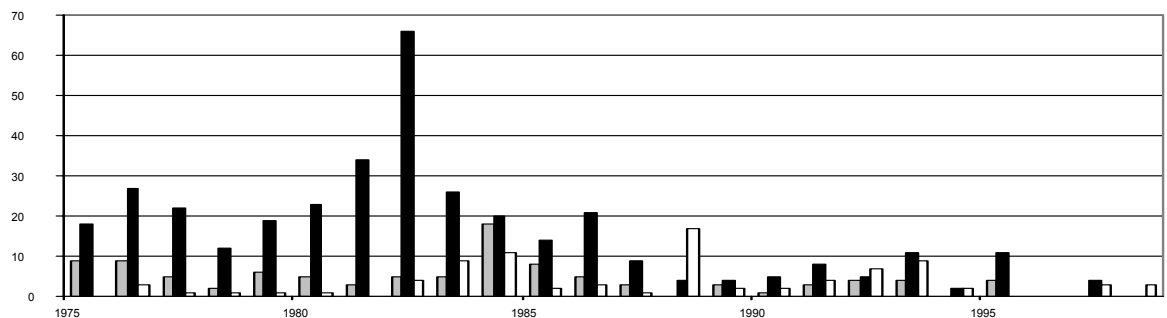


Figure 2c: Number of persons killed in France, 1975-1998

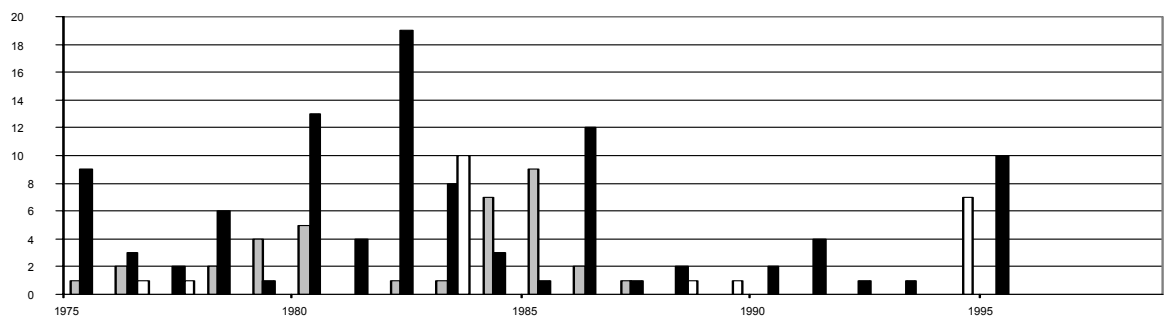
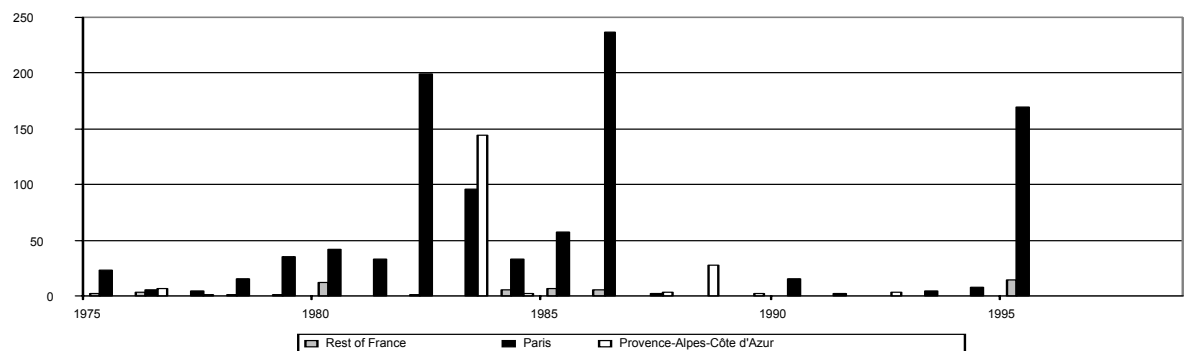
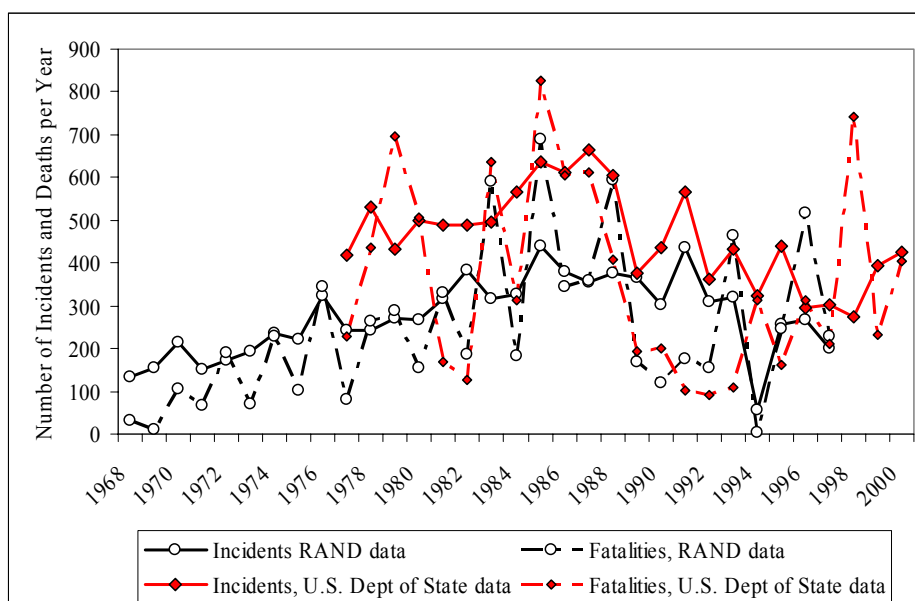


Figure 2d: Number of injured persons in France, 1975-1998



Source: See table 1.

Figure A-1. Transnational Terrorism, 1968-2000; Comparison of U.S. Dept. of State vs. RAND data



Source: U.S. Department of State, Patterns of Global Terrorism (various years), Sandler and Enders (2002), Table 1, and RAND-St. Andrews Chronology of International Terrorism, 1968-2000, provided by the Oklahoma City National Memorial Institute for the Prevention of Terrorism (www.mipt.org).